PAT-NO: JP02003083708A

DOCUMENT-IDENTIFIER: JP 2003083708 A

TITLE: FINGERPRINT SENSOR AND FINGERPRINT DETECTOR WITH THE SAME AS WELL AS FINGERPRINT-SENSOR MOUNTING STRUCTURE

PUBN-DATE: March 19, 2003

INVENTOR-INFORMATION:

NAME	COUNTRY
TAGO, MASAKI	N/A

ASSIGNEE-INFORMATION:

NAME	COUNTRY
NEC CORP	N/A

APPL-NO: JP2001272873

APPL-DATE: September 10, 2001

INT-CL (IPC): G01B007/28, A61B005/117 , G06T001/00 , H01L025/04 , H01L025/18 , H01L027/14 , H01L027/148 , H04N005/335

ABSTRACT:

PROBLEM TO BE SOLVED: To provide a fingerprint sensor which can be applied to a portable information terminal or the like, which is small and lightweight and which can be mounted at high density, to provide a mounting structure for the fingerprint sensor and to provide a fingerprint detector equipped with the fingerprint sensor.

SOLUTION: In the fingerprint sensor 1 which is provided with a sensor face 2

formed on a main face, a connecting electrode formed on the back and through
electrodes 3 used to connect the sensor face to the connecting electrodes, the
sensor face 2 is used as the surface, the connecting electrode installed on the
back of the fingerprint sensor and electrodes on an external connecting board 5
are electrically connected via solder or the like. By this constitution, as
compared with a conventional mounting structure using a bonding wire, the outer
shape of the fingerprint detector can be formed in a size a little larger than
the fingerprint sensor 1, and the fingerprint sensor can be mounted at high
density.

PATENT ABSTRACTS OF JAPAN

(11)Publication number : **2003-083708**

(43)Date of publication of application : **19.03.2003**

(51)Int.Cl.

G01B 7/28
A61B 5/117
G06T 1/00
H01L 25/04
H01L 25/18
H01L 27/14
H01L 27/148
H04N 5/335

(21)Application number : **2001-272873**

(22)Date of filing : **10.09.2001**

(71)Applicant : **NEC CORP**

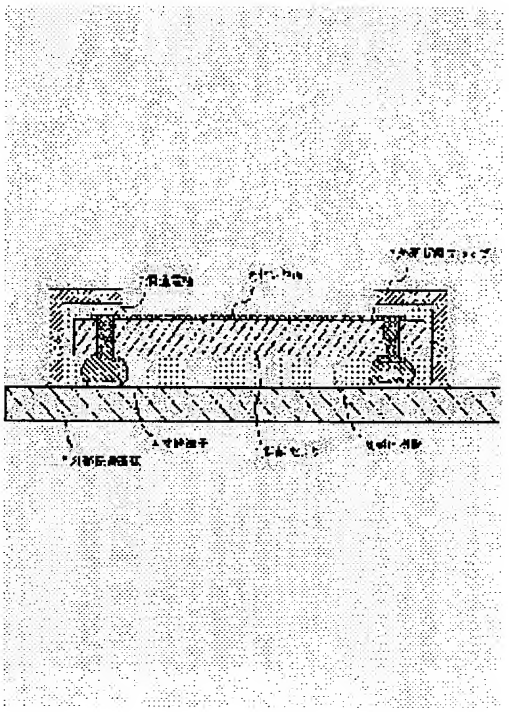
(72)Inventor : **TAGO MASAKI**

(54) FINGERPRINT SENSOR AND FINGERPRINT DETECTOR WITH THE SAME AS WELL AS FINGERPRINT-SENSOR MOUNTING STRUCTURE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a fingerprint sensor which can be applied to a portable information terminal or the like, which is small and lightweight and which can be mounted at high density, to provide a mounting structure for the fingerprint sensor and to provide a fingerprint detector equipped with the fingerprint sensor.

SOLUTION: In the fingerprint sensor 1 which is provided with a sensor face 2 formed on a main face, a connecting electrode formed on the back and through electrodes 3 used to connect the sensor face to the connecting electrodes, the sensor face 2 is used as the surface, the connecting electrode installed on the back of the fingerprint sensor and electrodes on an external connecting board 5 are electrically connected via solder or the like. By this constitution, as compared with a conventional mounting structure using a bonding wire, the outer shape of the fingerprint detector can be formed in a size a little larger than the fingerprint sensor 1, and the fingerprint sensor can be mounted at high density.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

[Translation done.]

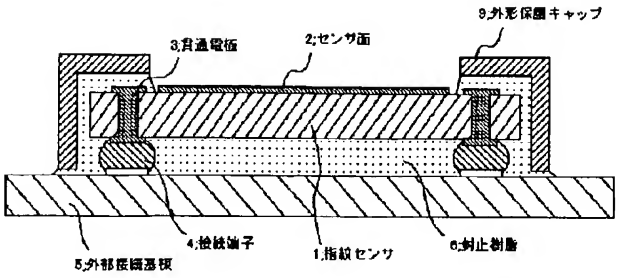
CLAIMS

[Claim(s)]
[Claim 1] The sensing element characterized by having the penetration electrode which connects the detection side established in the principal plane, the connection electrode prepared in the rear face, and said detection side and said connection electrode.
[Claim 2] The fingerprint sensor characterized by having the penetration electrode which connects the fingerprint detection side established in the principal plane, the connection electrode prepared in the rear face, and said fingerprint detection side and said connection electrode.
[Claim 3] The CCD component characterized by having the penetration electrode which connects the luminescence side established in the principal plane, the connection electrode prepared in the rear face, and said luminescence side and said connection electrode.
[Claim 4] It is the detector carry out that a sensing element is the detector which it comes to mount in an external substrate, said sensing element has the penetration electrode which connects the detection side established in the principal plane, the connection electrode prepared in the rear face, and said detection side and said connection electrode, opposite arrangement of said connection electrode of said sensing element and the electrode of said external substrate is carried out, and face down connection is made with a connection terminal as the description.
[Claim 5] It is the fingerprint detector a fingerprint sensor is the fingerprint detector which it comes to be mounted in an external substrate, and carry out that have the penetration electrode which connects the fingerprint detection side established in the principal plane, the connection electrode prepared in the rear face, and said fingerprint detection side and said connection electrode, the opposite arrangement of said connection electrode of said fingerprint sensor and the electrode of said external substrate is carried out, and the face down connection of said fingerprint sensor is made with a connection terminal as the description.
[Claim 6] The fingerprint detector according to claim 5 characterized by having a spacer for maintaining the surface smoothness of said fingerprint detection side between said connection electrode forming face of said fingerprint sensor, and said electrode forming face of said external substrate.
[Claim 7] The fingerprint detector according to claim 5 characterized by having a semiconductor chip for driving said fingerprint sensor between said connection electrode forming face of said fingerprint sensor, and said electrode forming face of said external substrate.
[Claim 8] It is the fingerprint detector according to claim 7 characterized by pulling out the penetration electrode connected to the circuit of said semiconductor chip among said penetration electrodes of said fingerprint sensor to the location which counters the circuit electrode of said semiconductor chip, connecting it to this circuit electrode, and connecting with said electrode of said external substrate the penetration electrode which is not used for connection with the circuit of said semiconductor chip.
[Claim 9] The fingerprint detector according to claim 7 or 8 characterized by carrying out two or more arrangement of said semiconductor chip.
[Claim 10] The fingerprint detector according to claim 7 to 9 characterized by processing said semiconductor chip into the thickness of 0.1mm or less.
[Claim 11] The fingerprint detector according to claim 6 to 10 characterized by arranging said spacer or said semiconductor chip in the clearance between said fingerprint sensor produced with said connection terminal, and said external substrate.
[Claim 12] The fingerprint detector according to claim 6 to 10 characterized by being arranged in the clearance between said fingerprint sensor which the crevice of the predetermined depth is formed in said fingerprint sensor loading side side of said external substrate, and said spacer or said semiconductor chip produces by said connection terminal and said crevice, and said external substrate.
[Claim 13] The fingerprint detector according to claim 5 to 12 with which said penetration electrode exposure between said fingerprint sensors and said external substrates and by the side of said fingerprint detection side is characterized by carrying out the closure with resin at least.

[Claim 14] The fingerprint detector according to claim 5 to 13 characterized by processing said fingerprint sensor into the thickness of 0.1mm or less.
[Claim 15] The personal digital assistant device characterized by having a fingerprint detector according to claim 5 to 14.
[Claim 16] The personal digital assistant device according to claim 15 characterized by being arranged so that said fingerprint detection side may be exposed from opening which said fingerprint detector prepared in the case of said pocket device, and fixing the perimeter of said fingerprint detection side to said case.

[Translation done.]

Drawing selection Representative drawing



[Translation done.]

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（A）　(11)特許出願公開番号
特開2003－83708
（P2003－83708A）
(43)公開日　平成15年３月19日(2003.3.19)

(51)Int.Cl.[7]		識別記号	FI		テーマコード(参考)
G01B	7/28		G01B	7/28	A　2F063
A61B	5/117		G06T	1/00	400G　4C038
G06T	1/00	400	H04N	5/335	W　4M118
H01L	25/04		A61B	5/10	322　5B047
	25/18		H01L	27/14	B　5C024

審査請求　未請求　請求項の数16　ＯＬ　（全 8 頁）　最終頁に続く

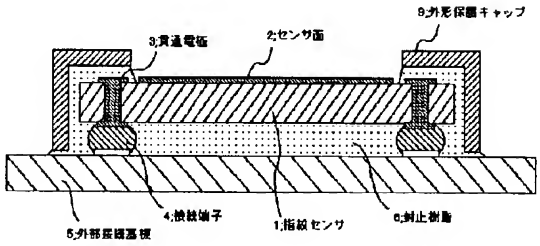
(21)出願番号　特願2001－272873(P2001－272873)
(22)出願日　平成13年９月10日(2001.9.10)

(71)出願人　000004237
日本電気株式会社
東京都港区芝五丁目７番１号
(72)発明者　田子　雅基
東京都港区芝五丁目７番１号　日本電気株式会社内
(74)代理人　100114672
弁理士　宮本　恵司

最終頁に続く

(54)【発明の名称】　指紋センサ及び指紋センサ実装構造並びに該指紋センサを備えた指紋検出器

(57)【要約】
【課題】携帯情報端末などに適用できる小型軽量で、高密度実装が可能な指紋センサ及びその実装構造並びに指紋センサを備えた指紋検出器の提供。
【解決手段】主面に設けたセンサ面２と、裏面に設けた接続電極と、センサ面と接続電極とを接続する貫通電極３とを備えた指紋センサ１を、センサ面２を上面にして指紋センサの裏面に設けた接続電極と外部接続基板５の電極とをハンダなどを介し電気的に接続する。この構成により、従来のボンディングワイヤを用いる実装構造に比べて、指紋検出器の外形を指紋センサ１よりやや大きい程度の寸法にすることができ、高密度実装が可能となる。



1

【特許請求の範囲】

【請求項１】主面に設けた検出面と、裏面に設けた接続電極と、前記検出面と前記接続電極とを接続する貫通電極とを備えることを特徴とする検出素子。

【請求項２】主面に設けた指紋検出面と、裏面に設けた接続電極と、前記指紋検出面と前記接続電極とを接続する貫通電極とを備えることを特徴とする指紋センサ。

【請求項３】主面に設けた発光面と、裏面に設けた接続電極と、前記発光面と前記接続電極とを接続する貫通電極とを備えることを特徴とするＣＣＤ素子。

【請求項４】検出素子が外部基板に実装されてなる検出器であって、

前記検出素子は、主面に設けた検出面と、裏面に設けた接続電極と、前記検出面と前記接続電極とを接続する貫通電極とを備え、前記検出素子の前記接続電極と前記外部基板の電極とが対向配置され、接続端子によりフェースダウン接続されていることを特徴とする検出器。

【請求項５】指紋センサが外部基板に実装されてなる指紋検出器であって、

前記指紋センサは、主面に設けた指紋検出面と、裏面に設けた接続電極と、前記指紋検出面と前記接続電極とを接続する貫通電極とを備え、前記指紋センサの前記接続電極と前記外部基板の電極とが対向配置され、接続端子によりフェースダウン接続されていることを特徴とする指紋検出器。

【請求項６】前記指紋センサの前記接続電極形成面と、前記外部基板の前記電極形成面との間に、前記指紋検出面の平坦性を保つためのスペーサーを備えることを特徴とする請求項５記載の指紋検出器。

【請求項７】前記指紋センサの前記接続電極形成面と、前記外部基板の前記電極形成面との間に、前記指紋センサを駆動するための半導体チップを備えることを特徴とする請求項５記載の指紋検出器。

【請求項８】前記指紋センサの前記貫通電極の内、前記半導体チップの回路に接続される貫通電極は、前記半導体チップの回路電極に対向する位置まで引き出されて該回路電極に接続され、前記半導体チップの回路との接続に使用されていない貫通電極は、前記外部基板の前記電極と接続されることを特徴とする請求項７記載の指紋検出器。

【請求項９】前記半導体チップが複数配設されていることを特徴とする請求項７又は８に記載の指紋検出器。

【請求項１０】前記半導体チップが、０．１ｍｍ以下の厚さに加工されていることを特徴とする請求項７乃至９のいずれか一に記載の指紋検出器。

【請求項１１】前記スペーサー、又は、前記半導体チップが、前記接続端子により生じる前記指紋センサと前記外部基板との隙間内に配設されることを特徴とする請求項６乃至１０のいずれか一に記載の指紋検出器。

【請求項１２】前記外部基板の前記指紋センサ搭載面側

2

に所定の深さの凹部が形成され、前記スペーサー、又は、前記半導体チップが、前記接続端子及び前記凹部により生じる前記指紋センサと前記外部基板との隙間内に配設されることを特徴とする請求項６乃至１０のいずれか一に記載の指紋検出器。

【請求項１３】少なくとも、前記指紋センサと前記外部基板との間、及び、前記指紋検出面側の前記貫通電極露出面が、樹脂により封止されていることを特徴とする請求項５乃至１２のいずれか一に記載の指紋検出器。

【請求項１４】前記指紋センサが、０．１ｍｍ以下の厚さに加工されていることを特徴とする請求項５乃至１３のいずれか一に記載の指紋検出器。

【請求項１５】請求項５乃至１４のいずれか一に記載の指紋検出器を備えたことを特徴とする携帯端末機器。

【請求項１６】前記指紋検出器が、前記携帯機器の筐体に設けた開口部から前記指紋検出面が露出するように配設され、かつ、前記指紋検出面の周囲が前記筐体に固定されていることを特徴とする請求項１５記載の携帯端末機器。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、各種検出素子及びその実装構造並びに該検出素子を備えた検出器に関し、特に、高密度化が要求される携帯機器ならびに携帯端末に使用される指紋センサ等の検出素子及びその実装構造並びに該検出素子を備えた検出器に関する。

【０００２】

【従来の技術】指紋を検出する指紋センサは、従来、入退室管理における扉の鍵に代わるものとして開発されてきたが、近年、コンピュータネットワークにおけるセキュリティ問題から、個人を認証する為の手段としてパーソナルコンピュータへの指紋センサの適用なども一部で始められている。

【０００３】指紋センサを用いた指紋検出方法としては、静電容量の変異を測定する静電容量式検出法と、反射光を検出する光学式検出法に大別されるが、小型化を考慮した場合、静電容量式検出法が有利であり、積極的に開発が進められている。ここで、従来の指紋センサの実装構造について図面を参照して説明する。

【０００４】図７は、従来の指紋センサを実装した指紋検出器の構造を示す断面図である。図に示すように、従来の指紋検出器は、回路基板（外部接続基板５）に指紋センサ１をダイボンディングし、指紋センサ１の接続端子４と外部接続基板５の端子とをボンディングワイヤ２０により電気的に接続した後、封止樹脂６で樹脂封止すると共に金属もしくは樹脂の外形保護キャップ９により周辺を覆う構造をとっている。そして、この指紋検出器はセキュリティを維持するパーソナルコンピュータなどの内部にあるドライバ回路やメモリに接続して駆動することにより利用される。

【0005】また、指紋センサ等のような接触型素子ではないが、CCD（固体撮像素子）などの非接触型素子では、指紋センサと同様のボンディングワイヤによる実装構造の上に、ガラスを利用した気密封止、もしくは透明樹脂を利用した封止が実施された構造となっている。

【0006】

【発明が解決しようとする課題】しかしながら、近年ではインターネット情報化や電子商取引の普及により、セキュリティ対策や個人認証の検討はパーソナルコンピュータのみならず、携帯可能な情報端末機器へと広がってきており、携帯情報端末機器にも搭載可能なように、検出器自体の高密度実装化が図られている。

【0007】ここで、従来の実装構造は、電気的接続をワイヤボンディングにより行うものであるため、ボンディングワイヤのループ高さを稼ぐために高さを確保する必要があり、また、ボンディングワイヤを接続するための接続エリアを設けなければならず、更に、これらのボンディングワイヤを保護するための樹脂被覆エリアを大きく設けなければならないという問題があり、高密度化に対しては不十分な構造である。

【0008】さらに、センサ駆動用のLSIや、センサで読み取った情報を記憶するメモリチップをセンサの周辺に2次元的に配置するため、実際の検出器としての容積は大きくなってしまい、高密度化を図ることができない。特に、携帯端末に付属するための検出器としては、より一層の高密度実装化が必要とされている。

【0009】また、CCDにおける画素数の増加は画質の向上に必要とされているが、電気的な接続点数の増加や、メモリ容量の増加が必要となり、従来のワイヤボンディングによる電気的な接続では接続点数の増加は見込めず、さらに高密度化も図れない。特に、ビデオカメラ、携帯端末などの用途では、小型軽量化、高密度実装化が望まれている。

【0010】本発明は、上記問題点に鑑みてなされたものであって、その主たる目的は、携帯情報端末などに適用できる小型軽量で、高密度実装が可能な各種センサ及びその実装構造並びにセンサを備えた検出器を提供することにある。

【0011】

【課題を解決するための手段】上記目的を達成するため、本発明の検出素子は、主面に設けた検出面と、裏面に設けた接続電極と、前記検出面と前記接続電極とを接続する貫通電極とを備えるものである。

【0012】また、本発明の指紋センサは、主面に設けた指紋検出面と、裏面に設けた接続電極と、前記指紋検出面と前記接続電極とを接続する貫通電極とを備えるものである。

【0013】また、本発明のCCD素子は、主面に設けた発光面と、裏面に設けた接続電極と、前記発光面と前記接続電極とを接続する貫通電極とを備えるものである。

【0014】本発明の検出器は、検出素子が外部基板に実装されてなる検出器であって、前記検出素子は、主面に設けた検出面と、裏面に設けた接続電極と、前記検出面と前記接続電極とを接続する貫通電極とを備え、前記検出素子の前記接続電極と前記外部基板の電極とが対向配置され、接続端子によりフェースダウン接続されているものである。

【0015】また、本発明の指紋検出器は、指紋センサが外部基板に実装されてなる指紋検出器であって、前記指紋センサは、主面に設けた指紋検出面と、裏面に設けた接続電極と、前記指紋検出面と前記接続電極とを接続する貫通電極とを備え、前記指紋センサの前記接続電極と前記外部基板の電極とが対向配置され、接続端子によりフェースダウン接続されているものである。

【0016】本発明においては、前記指紋センサの前記接続電極形成面と、前記外部基板の前記電極形成面との間に、前記指紋検出面の平坦性を保つためのスペーサーを備える構成とすることができる。

【0017】また、本発明においては、前記指紋センサの前記接続電極形成面と、前記外部基板の前記電極形成面との間に、前記指紋センサを駆動するための半導体チップを備える構成とすることもできる。

【0018】また、本発明においては、前記指紋センサの前記貫通電極の内、前記半導体チップの回路に接続される貫通電極は、前記半導体チップの回路電極に対向する位置まで引き出されて該回路電極に接続され、前記半導体チップの回路との接続に使用されていない貫通電極は、前記外部基板の前記電極と接続される構成とすることができる。

【0019】また、本発明においては、前記スペーサー、又は、前記半導体チップが、前記接続端子により生じる前記指紋センサと前記外部基板との隙間内に配設される構成、又は、前記外部基板の前記指紋センサ搭載面側に所定の深さの凹部が形成され、前記スペーサー、又は、前記半導体チップが、前記接続端子及び前記凹部により生じる前記指紋センサと前記外部基板との隙間内に配設される構成とすることができる。

【0020】また、本発明においては、少なくとも、前記指紋センサと前記外部基板との間、及び、前記指紋検出面側の前記貫通電極露出面が、樹脂により封止されていることが好ましい。

【0021】また、本発明においては、前記指紋センサが、0．1mm以下の厚さに加工されていることが好ましい。

【0022】また、本発明の携帯端末機器は、上記指紋検出器を備えたことを特徴とするものである。

【0023】本発明においては、前記指紋検出器が、前記携帯機器の筐体に設けた開口部から前記指紋検出面が露出するように配設され、かつ、前記指紋検出面の周囲

が前記筐体に固定されている構成とすることができる。

【００２４】このように、本発明に係る指紋センサ等の検出素子は、主面に設けたセンサ面と、裏面に設けた接続電極と、センサ面と裏面に設けた接続電極とを接続する貫通電極とを備えたことを特徴としている。この指紋センサをセンサ面を上面にして、指紋センサの裏面に設けた接続電極と外部接続基板の電極とをハンダなどを介して電気的に接続すると共に、樹脂により外部接続基板と指紋センサの間隙を充填する。指紋センサの外形をケースにより上部から保護し、センサ面を露出させた構造となっている。

【００２５】このように、指紋センサの裏面に接続用の電極を設け、この接続用電極とセンサ面の電極とを貫通電極により接続することによって、従来、ワイヤボンディングによって接続されていた構造に比べ、ワイヤの高さ及び接続に掛かる面積を大きく削減することができ、実装に掛かる容積を最小にすることできるという効果が得られる。

【００２６】また、本発明に係る指紋センサ等の検出素子を実装した検出器によれば、主面に設けたセンサと、裏面に設けた接続電極と、センサ面と裏面に設けた接続電極とを接続する貫通電極とを備え、センサ面を上面にして指紋センサの裏面に設けた接続電極と外部接続基板の電極とをハンダなどを介し電気的に接続すると共に、指紋センサの裏面に指紋センサの駆動に必要な半導体チップを接続したという特徴を有し、樹脂により外部接続基板と指紋センサの間隙を充填し、チップの外形をケースにより上部から保護し、センサ面を露出させた構造となっている。

【００２７】従来であれば、指紋センサの駆動用ＬＳＩや指紋センサで読み取った情報を記憶するメモリチップと指紋センサとの接続を外部接続基板を介して行っていたために、駆動用ＬＳＩやメモリチップを指紋センサの周辺に２次元的に配置するか、機能を必要とする本体機器に設けなければならず、実際の装置としての容積は大きくなり高密度化が図れなかった。しかし、本発明では、指紋センサの裏面のスペースに指紋センサの駆動に必要な半導体チップを接続することにより、特に携帯端末に付属するための指紋センサ装置としては、より一層の高密度実装化が可能となり、実装密度を著しく向上させる効果が得られる。

【００２８】

【発明の実施の形態】本発明の目的、特徴および利点を明確にすべく、添付した図面を参照しながら、本発明の実施の形態について以下に詳述する。図１は、本発明の一実施形態に係る指紋センサの構造を示す断面図であり、図２は指紋センサを基板に実装した状態を示す断面図である。

【００２９】図１及び図２に示すように、指紋センサ１は、センサ面２に形成された接続電極と、裏面に形成された接続用電極と、センサ面と裏面の接続電極を接続するための貫通電極３とが設けられた構造をとっている。また、指紋センサ１裏面の接続用電極と外部接続基板５とはハンダによる接続端子４によって接続され、センサ主面２を露出した状態で封止樹脂６及び外形保護のキャップ９を取り付けた構成となっている。

【００３０】このような構造によれば、指紋検出器の電気的接続は指紋センサ１の寸法内にある裏面に形成した電極により行なうことができるため、指紋検出器の外形寸法は指紋センサ１の大きさと外形保護の為のキャップ９によって決定され、実装した状態での容積を指紋センサ１に対して最小に抑えることができる。

【００３１】ここで、指紋センサ１の厚さは０．１ｍｍ程度であり、接続端子４はハンダによる接合のため、０．０９ｍｍ程度である。これを０．２ｍｍ程度の厚さの外部接続基板５に実装し樹脂封止すると、樹脂封止厚さ略０．１ｍｍ、外形保護のためのキャップ略０．２ｍｍを含めて、全体で略０．７ｍｍ以下に抑えることができ、高密度に実装できることを確認した。

【００３２】

【実施例】上記した本発明の実施の形態についてさらに詳細に説明すべく、本発明の実施例について図面を参照して説明する。

【００３３】［実施例１］まず、本発明の第１の実施例に係る指紋センサの実装構造及び指紋センサを備えた指紋検出器について、図３を参照して説明する。図３は、第１の実施例に係る指紋センサを実装した指紋検出器の構造を示す断面図である。

【００３４】図３に示すように、指紋センサ１には、センサ面２に形成された接続電極と、裏面に形成された外部接続基板５との接続用電極を接続するための貫通電極３とが設けられている。指紋センサ１裏面の接続用電極と外部接続基板５とはハンダによる接続端子４によって接続され、更に、指紋センサ１と外部接続基板５との間にはセンサ面２に指を押圧し指紋を検出する際の指紋センサ１に掛かる圧力を緩和するためのスペーサー８が配置され、センサ主面２を露出した状態で封止樹脂６及び外形保護のキャップ９を取り付けた構成となっている。

【００３５】この構造によれば、指紋検出器の電気的接続は指紋センサ１の寸法内にある裏面に形成した電極により行なうことができるため、指紋検出器の外形寸法は指紋センサ１の大きさと外形保護の為のキャップ９によって決定され、実装した状態での容積を指紋センサ１に対して最小に抑えることができる。また、スペーサー８によってセンサ面２に指を押圧し指紋を検出する際の指紋センサ１に掛かる圧力を緩和することが可能となり、指紋センサ１の破壊、または指紋センサ１の歪によって生じる誤検出を防止することができる。

【００３６】なお、図３では、スペーサー８を独立して挿入する構成としているが、外部接続基板５のスペーサ

ー8に対応する部分が凸形状となった一体型構造としても良い。また、スペーサー8としては、指の押圧で容易に変形しない程度以上の強度を有する任意の材料を用いることができるが、接続端子4との電気的接触を避けるためにプラスチック等のような絶縁性が高く加工が容易で軽量な材料を用いることがこのましい。

【0037】［実施例2］次に、本発明の第2の実施例に係る指紋センサの実装構造及び指紋センサを備えた指紋検出器について、図4及び図5を参照して説明する。図4は、第2の実施例に係る指紋センサを実装した指紋検出器の構造を示す断面図である。図5は、指紋検出器の他の構造を示す断面図である。

【0038】図4に示すように、指紋センサ1には、センサ面2に形成された接続電極と、裏面に形成された外部接続基板5との接続用電極を接続するための貫通電極3とが設けられている。指紋センサ1の裏面には、指紋センサ1の駆動に必要な半導体チップ7が接続され、指紋センサ1は裏面の接続用電極と外部接続基板5はハンダによる接続端子4によって接続され、センサ主面2を露出した状態で封止樹脂6及び外形保護のキャップ9を取り付けた構成となっている。

【0039】この構造によれば、センサの駆動に必要な半導体チップ7も接続端子4で囲まれたスペースに配置しており、半導体チップ7を実装した状態で、指紋検出器の電気的接続は指紋センサ1の寸法内にある裏面に形成した電極により行なっているため、指紋検出器の外形寸法は指紋センサ1の大きさと外形保護の為のキャップ9によって決定され、実装した状態での容積を指紋センサ1に対して最小に抑え、実装密度を向上させることができる。

【0040】また、このような構造をとることにより高密度実装が可能になると共に、ドライバICやメモリ等とセンサとの接続距離を短くすることができ、大容量の情報を必要とする場合など、高速化においても効果をあげることが出来る。

【0041】なお、指紋センサ1の駆動用の半導体チップ7としては、ドライバチップのほか、メモリやマイコンなどを必要に応じて用いることができ、各種半導体チップを1個又は2個以上接続することも可能である。

【0042】また、指紋センサ1の駆動に必要な半導体チップ7が大きい場合には、図5に示すように、外部接続基板5側を加工し、外形寸法を増加させることなく、高密度に実装することができる。搭載する部品の大きさが異なる場合には、この様な形態をとることによって、本実装構造の適用範囲を広げることができる。

【0043】［実施例3］次に、本発明の第3の実施例に係る指紋センサの実装構造及び指紋センサを備えた携帯電話機について、図6を参照して説明する。図6は、第3の実施例に係る指紋センサを実装した携帯電話機の構造を模式的に示す断面図である。

【0044】図6に示すように、携帯電話の部品を実装する実装基板10の片面に、センサ面2に形成された接続電極と、裏面に形成された接続用電極とを接続するための貫通電極3が形成された指紋センサ1がハンダによる接続端子4によって実装され、センサ主面2を露出した状態で封止樹脂6がコートされている。

【0045】また、実装基板10の同じ面及び裏面には、その他の携帯電話を構成するLSIやチップ部品が実装されている。この実装基板10は、筐体11の一部に開口された部分に指紋センサ1のセンサ面2が位置するように構成され、センサ面を露出し、外形を保護すると共に、その他のマイク部16、スピーカ部17、アンテナ14、ディスプレイ部12、電池部18、キーパッド13など携帯電話を構成する部品と共に筐体11に収められている。

【0046】この構造によれば、指紋センサ1の外形を保護するためのキャップ9を使用することなく、機器の筐体裏面を外形保護キャップ9として利用することができ、高密度化を図り、携帯電話等の小型機器に実装することが可能である。また、検出器の電気的接続は指紋センサ1の寸法内にある裏面に形成した電極により行なっているので、検出器の占める外形寸法の割合は指紋センサ1の大きさと等しく、実装密度を向上させることが可能となる。

【0047】これら一連の発明において、指紋センサ1の厚さは貫通電極3を形成するために薄くすることが望ましく、0．1mm程度の厚さが通常適用される。実装密度向上の観点から指紋センサ1はさらに薄く加工しても良く、現在、0．05mmまで薄く加工することが可能である。また、指紋センサ1の反りや、強度の観点から剛性が必要な場合は0．1mmに限定することなく、適宜厚さを増しても良い。

【0048】また、第1及び第2の実施例では、外形を保護するキャップ9を取り付けた構造を示したが、センサ面2が露出していれば良く、センサ面2を囲むようにダムを設け、封止樹脂6で封止するのみの構造でも良い。

【0049】また、裏面電極には接続端子4がハンダによって接続されているが、ハンダによらず、Au、Sn、Cuまたはこれらの合金などを用いた通常の電子機器の実装に使用される接続技術を用いても良い。

【0050】なお、前記した実施例では、指紋センサならびに携帯電話の実装構造についてのみ記載したが、本発明は上記実施例に限定されるものではなく、接触式の他の種類のセンサ、また、非接触式のセンサである固体撮像素子などの実装や、任意の半導体チップの複合実装、小型軽量化が求められる任意の携帯端末機器の実装にも応用することが可能である。

【0051】

【発明の効果】以上説明したように、本発明の指紋セン

サは、主面に設けたセンサ面と、裏面に設けた接続電極と、指紋センサと裏面に設けた接続電極とを接続する貫通電極とを備えており、この指紋センサをセンサ面を上面にして指紋センサの裏面に設けた接続電極と外部接続基板の電極とをハンダなどを介し電気的に接続すると共に、樹脂により外部接続基板と指紋センサの間隙を充填し、チップの外形をケースにより上部から保護し、センサ面を露出させた構造となっている。

【００５２】このような基本構成に基づき、指紋センサの裏面に接続用の電極を設け、この接続用電極とセンサ面の電極とを貫通電極により接続することで、従来、ワイヤボンディングによって接続されていた構造に比べ、ワイヤの高さ及び接続に掛かる面積を大きく削減することができ、実装に掛かる容積を最小にすることできるという効果が得られる。

【００５３】また、スペーサーを指紋センサと外部接続基板との間に設けることにより、指紋を読み取る際のセンサに掛かる押圧力による指紋センサの変形や破損を防ぐことができ、誤検出や破損による故障を防止した信頼性の高い指紋検出器を提供することができる。

【００５４】また、本発明の指紋検出器は、主面に設けたセンサ面と、裏面に設けた接続電極と、指紋センサと裏面に設けた接続電極とを接続する貫通電極とを備え、センサ面を上面にして指紋センサの裏面に設けた接続電極と外部接続基板の電極とをハンダなどを介し電気的に接続すると共に、指紋センサの裏面に指紋センサの駆動に必要な半導体チップを接続し、樹脂により外部接続基板と指紋センサの間隙を充填し、チップの外形をケースにより上部から保護し、センサ面を露出させた構造となっている。

【００５５】従来であれば、指紋センサの駆動用ＬＳＩや指紋センサで読み取った情報を記憶するメモリチップと指紋センサの接続を外部接続基板を介して行っていたために、周辺に２次元的に配置するか、機能を必要とする本体機器に設けなければならず、実際の装置としての容積は大きくなり高密度化が図れなかったが、本発明では、指紋センサの裏面のスペースに指紋センサの駆動に必要な半導体チップを接続することにより、特に携帯端末に付属するための指紋センサ装置としては、より一層の高密度実装化が可能となり、実装密度を著しく向上させる効果が得られ、かつ、ドライバＩＣやメモリ等と指紋センサとの接続距離が短くなり、大容量の情報を必要とする場合など、高速化においても効果をあげることができる。

【００５６】また、本発明の携帯電話機は、携帯電話の部品を実装する実装基板の片面にセンサ面に形成された接続電極と、裏面に形成された接続用電極を接続するための貫通電極が形成された指紋センサがハンダによる接続端子によって実装され、センサ主面を露出した状態で封止樹脂がコートされ、また実装基板の同じ面及び裏面にはその他の携帯電話を構成するＬＳＩやチップ部品が実装され、この実装基板は筐体の一部に開口された部分に指紋センサが位置し、センサ面を露出し、外形を保護すると共に、その他のマイク、スピーカ、アンテナ、ディスプレイ、電池、キーパッドなど携帯電話を構成する部品と共に筐体に収められた構造となっている。

【００５７】このような基本構成に基づき、指紋センサの外形保護キャップの簡素化による高密度化を図ることができ、またセンサ装置の電気的接続は指紋センサの寸法内にある裏面に形成した電極により行なっているので、センサ装置の占める外形寸法の割合は指紋センサの大きさと等しく、実装密度を向上させた携帯端末機器の実装構造が提供できる。また、本発明では携帯電話機の実装構造について述べているが、例えば、ICカードや、自動車の鍵、住宅扉の鍵など、小型でかつ個人にて機能を有することでセキュリティが向上する部品や耐候性が必要な部品へ高密度な実装構造を提供することができる。

【００５８】なお、本発明は上記各実施例に限定されず、本発明の技術思想の範囲内において、各実施例は適宜変更され得ることは明らかである。

【図面の簡単な説明】

【図１】本発明の一実施の形態に係る指紋センサの構造を示す断面図である。

【図２】本発明の一実施の形態に係る指紋センサの実装構造を示す断面図である。

【図３】本発明の第１の実施例に係る指紋センサの実装構造を示す断面図である。

【図４】本発明の第２の実施例に係る指紋センサの実装構造を示す断面図である。

【図５】本発明の第２の実施例に係る指紋センサの実装構造を示す断面図である。

【図６】本発明の第３の実施例に係る指紋センサの実装構造を示した携帯端末機器の断面図である。

【図７】従来の指紋センサの実装構造を示す断面図である。

【符号の説明】

１　指紋センサ
２　センサ面
３　貫通電極
４　接続端子
５　外部接続基板
６　封止樹脂
７　半導体チップ
８　スペーサー
９　外形保護キャップ
１０　実装基板
１１　筐体
１２　ディスプレイ部
１３　キーパッド部

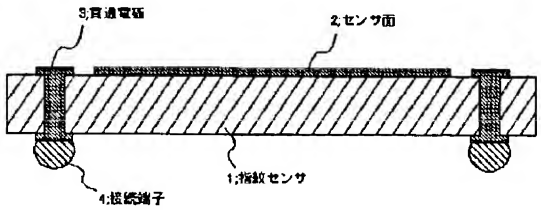
11

14　アンテナ
15　実装部品
16　マイク部

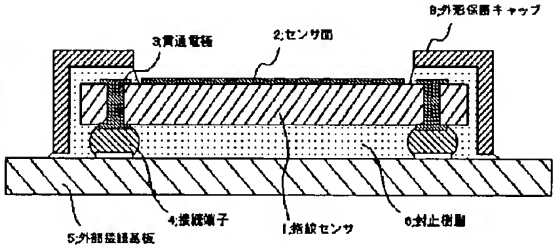
12

17　スピーカ部
18　電池部
20　ボンディングワイヤ

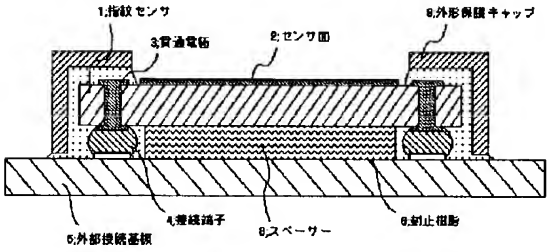
【図1】



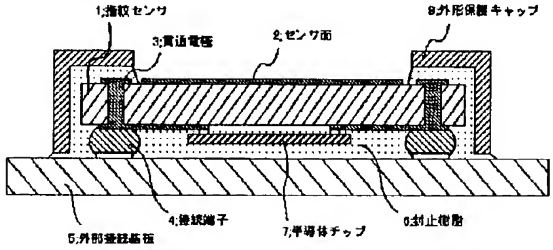
【図2】



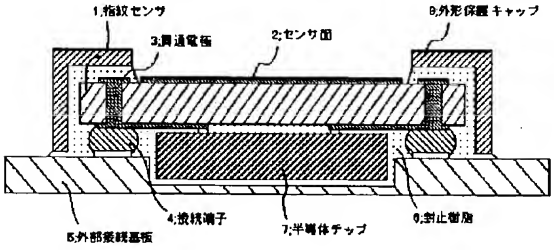
【図3】



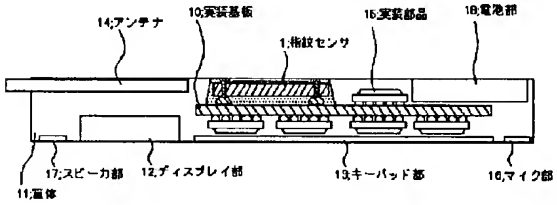
【図4】



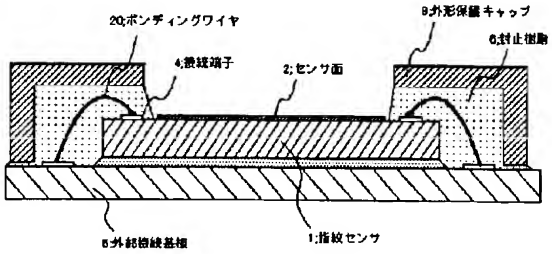
【図5】



【図6】



【図7】



フロントページの続き

(51)Int.Cl.[7]	識別記号	FI		テーマコード(参考)
H01L	27/14	H01L	27/14	D
	27/148		25/04	Z
H04N	5/335			

Fターム(参考)　2F063 AA43 BA29 BA30 BD05 BD11
CA08 CA35 DA02 DA05 DD07
HA01 HA04 NA06
4C038 FF01
4M118 AA10 AB10 BA10 HA20 HA22
HA24 HA31 HA33
5B047 AA25
5C024 BX00 CY47 EX21 GY01

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the detector which equipped with this sensing element a sensing element and its mounting structure lists, such as a fingerprint sensor used for the pocket device and personal digital assistant with which densification is demanded especially, about the detector which equipped various sensing elements and the mounting structure list of those with this sensing element.
[0002]
[Description of the Prior Art] Although the fingerprint sensor which detects a fingerprint has been conventionally developed as what is replaced with the key of the door in close leaving management, application of the fingerprint sensor to a personal computer etc. can be partly begun as a means for attesting an individual from the security issue in a computer network in recent years.
[0003] Although divided roughly into the electrostatic-capacity type detecting method which measures the variation of electrostatic capacity, and the optical detecting method for detecting the reflected light as the fingerprint detection approach using a fingerprint sensor, when a miniaturization is taken into consideration, the electrostatic-capacity type detecting method is advantageous, and development is furthered positively. Here, the mounting structure of the conventional fingerprint sensor is explained with reference to a drawing.
[0004] Drawing 7 is the sectional view showing the structure of a fingerprint detector where the conventional fingerprint sensor was mounted. As shown in drawing, after the conventional fingerprint detector carries out die bonding of the fingerprint sensor 1 to the circuit board (external connection substrate 5) and connects electrically the connection terminal 4 of the fingerprint sensor 1, and the terminal of the external connection substrate 5 by the bonding wire 20, it has taken wrap structure for the circumference with the metal or the appearance protective cap 9 of resin while carrying out a resin seal by closure resin 6. And this fingerprint detector is used by connecting with the driver circuit and memory in the interior, such as a personal computer which maintains security, and driving.
[0005] Moreover, although it is not contact mold components, such as a fingerprint sensor, with non-contact mold components, such as CCD (solid state image sensor), it has the structure where the hermetic seal which used glass on the mounting structure by the same bonding wire as a fingerprint sensor, or the closure using transparence resin was carried out.
[0006]
[Problem(s) to be Solved by the Invention] However, in recent years, high-density-assembly-ization of the detector itself is attained so that examination of security countermeasures or personal authentication may have spread not only to a personal computer but to the portable information terminal equipment and can be carried also in a Personal Digital Assistant device by the spread of the Internet computerization or electronic commerce.
[0007] Since it is that to which the conventional mounting structure performs electrical installation by wirebonding here, the connection area for securing height, in order to earn the loop-formation height of a bonding wire, and connecting a bonding wire must be prepared, there is a problem that the resin covering area for protecting these bonding wires must be prepared greatly, further, and it is inadequate structure to densification.
[0008] Furthermore, since the memory chip which memorizes LSI for a sensor drive and the information read by the sensor is arranged two-dimensional around a sensor, the volume as an actual detector cannot become large and cannot attain densification. Much more high-density-assembly-ization is needed as a detector for being attached to a personal digital assistant especially.
[0009] Moreover, although the increment in the number of pixels in CCD is needed for improvement in image quality, the increment in the electric number of nodes and the increment in memory space are needed, in the electric connection by the conventional wirebonding, the increment in the number of nodes cannot be expected and densification cannot be attained further, either. Especially, the formation of small lightweight and high-density-assembly-ization are desired for the application of a video camera, a personal digital assistant, etc.

[0010] This invention is made in view of the above-mentioned trouble, and the main purpose is a small light weight applicable to a Personal Digital Assistant etc., and is to offer the detector which equipped with the sensor the various sensors in which high density assembly is possible, and the mounting structure list of those.
[0011]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, the sensing element of this invention is equipped with the penetration electrode which connects the detection side established in the principal plane, the connection electrode prepared in the rear face, and said detection side and said connection electrode.
[0012] Moreover, the fingerprint sensor of this invention is equipped with the penetration electrode which connects the fingerprint detection side established in the principal plane, the connection electrode prepared in the rear face, and said fingerprint detection side and said connection electrode.
[0013] Moreover, the CCD component of this invention is equipped with the penetration electrode which connects the luminescence side established in the principal plane, the connection electrode prepared in the rear face, and said luminescence side and said connection electrode.
[0014] The detector of this invention is a detector with which it comes to mount a sensing element in an external substrate, said sensing element has the penetration electrode which connects the detection side established in the principal plane, the connection electrode prepared in the rear face, and said detection side and said connection electrode, opposite arrangement of said connection electrode of said sensing element and the electrode of said external substrate is carried out, and face down connection is made with the connection terminal.
[0015] Moreover, the fingerprint detector of this invention is the fingerprint detector with which it comes to be mounted a fingerprint sensor in an external substrate, said fingerprint sensor has the penetration electrode which connects the fingerprint detection side established in the principal plane, the connection electrode prepared in the rear face, and said fingerprint detection side and said connection electrode, the opposite arrangement of said connection electrode of said fingerprint sensor and the electrode of said external substrate is carried out, and face down connection is made with a connection terminal.
[0016] In this invention, it can consider as a configuration equipped with the spacer for maintaining the surface smoothness of said fingerprint detection side between said connection electrode forming face of said fingerprint sensor, and said electrode forming face of said external substrate.
[0017] Moreover, in this invention, it can also consider as a configuration equipped with the semiconductor chip for driving said fingerprint sensor between said connection electrode forming face of said fingerprint sensor, and said electrode forming face of said external substrate.
[0018] Moreover, in this invention, the penetration electrode connected to the circuit of said semiconductor chip among said penetration electrodes of said fingerprint sensor is pulled out to the location which counters the circuit electrode of said semiconductor chip, and is connected to this circuit electrode, and the penetration electrode which is not used for connection with the circuit of said semiconductor chip can be considered as the configuration connected with said electrode of said external substrate.
[0019] In this invention Moreover, said spacer, Or the configuration arranged in the clearance between said fingerprint sensor which said semiconductor chip produces with said connection terminal, and said external substrate, Or the crevice of the predetermined depth is formed in said fingerprint sensor loading side side of said external substrate, and said spacer or said semiconductor chip can consider as the configuration arranged in the clearance between said fingerprint sensor produced by said connection terminal and said crevice, and said external substrate.
[0020] Moreover, in this invention, it is desirable that the closure of said penetration electrode exposure between said fingerprint sensors and said external substrates and by the side of said fingerprint detection side is carried out with resin at least.
[0021] Moreover, in this invention, it is desirable that said fingerprint sensor is processed into the thickness of 0.1mm or less.
[0022] Moreover, the personal digital assistant device of this invention is characterized by having the above-mentioned fingerprint detector.
[0023] In this invention, it can consider as the configuration in which it is arranged in so that said fingerprint detection side may be exposed from opening which said fingerprint detector prepared in the case of said pocket device, and the perimeter of said fingerprint detection side is being fixed to said case.
[0024] Thus, sensing elements, such as a fingerprint sensor concerning this invention, are characterized by having the penetration electrode which connects the sensor side established in the principal plane, the connection electrode prepared in the rear face, and the connection electrode prepared in the sensor side and the rear face. While connecting electrically the connection electrode which used the sensor side as the top face and formed this fingerprint sensor in the rear face of a fingerprint sensor, and the electrode of an external connection substrate through a pewter etc., it is filled up with the gap of an external connection substrate and a fingerprint sensor with resin. The appearance of a fingerprint sensor is protected from the upper part in a case, and it has structure in which the sensor side was exposed.

[0025] Thus, by preparing the electrode for connection in the rear face of a fingerprint sensor, and connecting this electrode for connection, and the electrode of a sensor side with a penetration electrode, compared with the structure connected by wirebonding, the area concerning the height of a wire and connection can be reduced greatly, and the effectiveness which makes the volume concerning mounting min that things can be carried out is acquired conventionally.
[0026] Moreover, according to the detector which mounted sensing elements, such as a fingerprint sensor concerning this invention It has the penetration electrode which connects the sensor formed in the principal plane, the connection electrode prepared in the rear face, and the connection electrode prepared in the sensor side and the rear face. While connecting electrically the connection electrode which used the sensor side as the top face and established it in the rear face of a fingerprint sensor, and the electrode of an external connection substrate through a pewter etc. It has the description of having connected the semiconductor chip required for the drive of a fingerprint sensor to the rear face of a fingerprint sensor, and is filled up with the gap of an external connection substrate and a fingerprint sensor with resin, the appearance of a chip is protected from the upper part in a case, and it has structure in which the sensor side was exposed.
[0027] Since connection between the memory chip which memorizes the information read by LSI for a drive of a fingerprint sensor or the fingerprint sensor, and a fingerprint sensor was made through the external connection substrate when it was the former, it had to prepare in the body device which arranges LSI for a drive, and a memory chip two-dimensional around a fingerprint sensor, or needs a function, and the volume as actual equipment became large and was not able to attain densification. however, the thing for which a required semiconductor chip is connected to the drive of a fingerprint sensor to the tooth space of the rear face of a fingerprint sensor in this invention -- especially, much more high-density-assembly-ization is attained as fingerprint sensor equipment for being attached to a personal digital assistant, and the effectiveness of raising packaging density remarkably is acquired.
[0028]
[Embodiment of the Invention] The gestalt of operation of this invention is explained in full detail below, referring to the attached drawing that the purpose, the description, and advantage of this invention should be made clear. Drawing 1 is the sectional view showing the structure of the fingerprint sensor concerning 1 operation gestalt of this invention, and drawing 2 is the sectional view showing the condition of having mounted the fingerprint sensor in the substrate.
[0029] As shown in drawing 1 and drawing 2 , the fingerprint sensor 1 has taken the structure where the connection electrode formed in the sensor side 2, the electrode for connection formed in the rear face, and the penetration electrode 3 for connecting the connection electrode of a sensor side and a rear face were formed. Moreover, the connection terminal 4 by the pewter connects and the electrode for connection and the external connection substrate 5 of fingerprint sensor 1 rear face have the composition of having attached closure resin 6 and the cap 9 of appearance protection where the sensor principal plane 2 is exposed.
[0030] Since the electrode formed in the rear face in the dimension of the fingerprint sensor 1 can perform electrical installation of a fingerprint detector according to such structure, the dimension of a fingerprint detector is determined by the magnitude of the fingerprint sensor 1, and the cap 9 for appearance protection, and can hold down to min the volume in the condition of having mounted, to the fingerprint sensor 1.
[0031] Here, the thickness of the fingerprint sensor 1 is about 0.1mm, and the connection terminal 4 is about 0.09mm because of junction by the pewter. When the resin seal of this was mounted and carried out to the external connection substrate 5 with a thickness of about 0.2mm, including 0.2mm of cap abbreviation for 0.1mm of resin seal thickness abbreviation, and appearance protection, it could hold down to 0.7mm or less of abbreviation on the whole, and checked that it could mount in high density.
[0032]
[Example] The gestalt of operation of above-mentioned this invention is explained with reference to a drawing about the example of this invention that it should explain to a detail further.
[0033] [Example 1] The fingerprint detector first equipped with the mounting structure of a fingerprint sensor and the fingerprint sensor concerning the 1st example of this invention is explained with reference to drawing 3 . Drawing 3 is the sectional view showing the structure of a fingerprint detector where the fingerprint sensor concerning the 1st example was mounted.
[0034] As shown in drawing 3 , the connection electrode formed in the sensor side 2 and the penetration electrode 3 for connecting the electrode for connection with the external connection substrate 5 formed in the rear face are formed in the fingerprint sensor 1. The electrode for connection and the external connection substrate 5 of fingerprint sensor 1 rear face are connected by the connection terminal 4 by the pewter. Furthermore, the spacer 8 for easing the pressure concerning the fingerprint sensor 1 at the time of pressing a finger between the fingerprint sensor 1 and the external connection substrate 5 in the sensor side 2, and detecting a fingerprint is arranged, and it has the composition of having attached closure resin 6 and the cap 9 of appearance protection where the sensor principal plane 2 is exposed.
[0035] Since the electrode formed in the rear face in the dimension of the fingerprint sensor 1 can perform electrical

installation of a fingerprint detector according to this structure, the dimension of a fingerprint detector is determined by the magnitude of the fingerprint sensor 1, and the cap 9 for appearance protection, and can hold down to min the volume in the condition of having mounted, to the fingerprint sensor 1. Moreover, it becomes possible to ease the pressure concerning the fingerprint sensor 1 at the time of pressing a finger to the sensor side 2 and detecting a fingerprint with a spacer 8, and the incorrect detection produced by destruction of the fingerprint sensor 1 or distortion of the fingerprint sensor 1 can be prevented.

[0036] In addition, although considered as the configuration which inserts a spacer 8 independently in drawing 3 , it is good also as one apparatus structure from which the part corresponding to the spacer 8 of the external connection substrate 5 became a convex configuration. Moreover, it is this better ** to use an ingredient that insulation, such as plastics, is high and processing is easy and lightweight, in order to avoid electric contact for the connection terminal 4 although the ingredient of the arbitration which has the reinforcement more than extent which does not deform easily by press of a finger as a spacer 8 can be used.

[0037] The fingerprint detector equipped with the mounting structure of a fingerprint sensor and the fingerprint sensor concerning [an example 2], next the 2nd example of this invention is explained with reference to drawing 4 and drawing 5 . Drawing 4 is the sectional view showing the structure of a fingerprint detector where the fingerprint sensor concerning the 2nd example was mounted. Drawing 5 is the sectional view showing other structures of a fingerprint detector.

[0038] As shown in drawing 4 , the connection electrode formed in the sensor side 2 and the penetration electrode 3 for connecting the electrode for connection with the external connection substrate 5 formed in the rear face are formed in the fingerprint sensor 1. The semiconductor chip 7 required for the drive of the fingerprint sensor 1 is connected to the rear face of the fingerprint sensor 1, the electrode for connection and the external connection substrate 5 on the back are connected by the connection terminal 4 by the pewter, and the fingerprint sensor 1 has the composition of having attached closure resin 6 and the cap 9 of appearance protection where the sensor principal plane 2 is exposed.

[0039] Where according to this structure it also arranged the semiconductor chip 7 required for the drive of a sensor to the tooth space surrounded with the connection terminal 4 and a semiconductor chip 7 is mounted Since the electrode formed in the rear face in the dimension of the fingerprint sensor 1 is performing electrical installation of a fingerprint detector, The dimension of a fingerprint detector can be determined by the magnitude of the fingerprint sensor 1, and the cap 9 for appearance protection, can hold down to min the volume in the condition of having mounted, to the fingerprint sensor 1, and can raise packaging density.

[0040] Moreover, while high density assembly becomes possible by taking such structure, when connection distance of a driver IC, memory, etc. and a sensor can be shortened and you need mass information, also in improvement in the speed, it can obtain effectiveness.

[0041] In addition, as a semiconductor chip 7 for the drive of the fingerprint sensor 1, others, memory, a microcomputer, etc. can be used if needed, and it is also possible in various semiconductor chips one piece or for two or more pieces to connect. [chip / driver]

[0042] Moreover, it can mount in high density, without processing the external connection substrate 5 side and making a dimension increase, as shown in drawing 5 , when the semiconductor chip 7 required for the drive of the fingerprint sensor 1 is large. When the magnitude of the components to carry differs, the applicability of this mounting structure can be extended by taking such a gestalt.

[0043] The portable telephone equipped with the mounting structure of a fingerprint sensor and the fingerprint sensor concerning [an example 3], next the 3rd example of this invention is explained with reference to drawing 6 . Drawing 6 is the sectional view showing typically the structure of a portable telephone where the fingerprint sensor concerning the 3rd example was mounted.

[0044] As shown in drawing 6 , the fingerprint sensor 1 by which the penetration electrode 3 for connecting the connection electrode formed in the sensor side 2 and the electrode for connection formed in the rear face was formed in one side of the mounting substrate 10 which mounts the components of a cellular phone is mounted with the connection terminal 4 by the pewter, and where the sensor principal plane 2 is exposed, the coat of the closure resin 6 is carried out.

[0045] Moreover, LSI and the chip which constitute other cellular phones are mounted in the same field and same rear face of the mounting substrate 10. It is stored in the case 11 with the components which constitute cellular phones, such as the other microphone sections 16, the loudspeaker section 17, an antenna 14, the display section 12, the cell section 18, and a keypad 13, while this mounting substrate 10 is constituted so that the sensor side 2 of the fingerprint sensor 1 may be located in the part by which opening was carried out to some cases 11, it exposes a sensor side and protects an appearance.

[0046] It is possible to be able to use the case rear face of a device as an appearance protective cap 9, to attain densification, and to mount in small devices, such as a cellular phone, without using the cap 9 for protecting the appearance of the fingerprint sensor 1 according to this structure. Moreover, since the electrode formed in the rear face

in the dimension of the fingerprint sensor 1 is performing electrical installation of a detector, it becomes the rate of the dimension which a detector occupies is equal to the magnitude of the fingerprint sensor 1, and possible to raise packaging density.
[0047] In invention of these single strings, as for the thickness of the fingerprint sensor 1, it is desirable to make it thin in order to form the penetration electrode 3, and the thickness which is about 0.1mm is usually applied. It is possible to process the fingerprint sensor 1 still more thinly from a viewpoint of the improvement in packaging density, and to process it thinly to current and 0.05mm. Moreover, thickness may be increased suitably, without limiting to 0.1mm from the curvature of the fingerprint sensor 1, and a strong viewpoint, when rigidity is required.
[0048] Moreover, although the 1st and 2nd examples showed the structure which attached the cap 9 which protects an appearance, just exposed [the sensor side 2], a dam may be prepared so that the sensor side 2 may be surrounded, and the structure of only closing by closure resin 6 is sufficient.
[0049] Moreover, although the connection terminal 4 is connected to the rear-face electrode by the pewter, it may not be based on a pewter but the connection technique used for mounting of the usual electronic equipment using Au, Sn, Cu(s), or these alloys may be used.
[0050] In addition, although the above mentioned example indicated only the mounting structure of a fingerprint sensor and a cellular phone, it is not limited to the above-mentioned example and this invention can be applied also to mounting of the solid state image sensor which are the sensor of other classes of contact process, and a non-contact-type sensor, and compound mounting of the semiconductor chip of arbitration and mounting of the personal digital assistant device of arbitration by which small lightweight-ization is called for.
[0051]
[Effect of the Invention] As explained above, the fingerprint sensor of this invention It has the penetration electrode which connects the sensor side established in the principal plane, the connection electrode prepared in the rear face, and a fingerprint sensor and the connection electrode prepared in the rear face. While connecting electrically the connection electrode which used the sensor side as the top face and formed this fingerprint sensor in the rear face of a fingerprint sensor, and the electrode of an external connection substrate through a pewter etc. It is filled up with the gap of an external connection substrate and a fingerprint sensor with resin, the appearance of a chip is protected from the upper part in a case, and it has structure in which the sensor side was exposed.
[0052] Based on such a basic configuration, the electrode for connection can be prepared in the rear face of a fingerprint sensor, the area applied to the height of a wire and connection compared with the structure connected by wirebonding can be conventionally reduced greatly by connecting this electrode for connection, and the electrode of a sensor side with a penetration electrode, and the effectiveness which makes the volume concerning mounting min that things can be carried out is acquired.
[0053] Moreover, by forming a spacer between a fingerprint sensor and an external connection substrate, the deformation and breakage of a fingerprint sensor by the thrust concerning the sensor at the time of reading a fingerprint can be prevented, and the reliable fingerprint detector which prevented failure by incorrect detection or breakage can be offered.
[0054] Moreover, the sensor side which formed the fingerprint detector of this invention in the principal plane and the connection electrode prepared in the rear face, While connecting electrically the connection electrode which was equipped with the penetration electrode which connects a fingerprint sensor and the connection electrode prepared in the rear face, used the sensor side as the top face, and was prepared in the rear face of a fingerprint sensor, and the electrode of an external connection substrate through a pewter etc. A semiconductor chip required for the drive of a fingerprint sensor is connected to the rear face of a fingerprint sensor, it is filled up with the gap of an external connection substrate and a fingerprint sensor with resin, the appearance of a chip is protected from the upper part in a case, and it has structure in which the sensor side was exposed.
[0055] Since connection of the memory chip which memorizes the information read by LSI for a drive of a fingerprint sensor or the fingerprint sensor, and a fingerprint sensor was made through the external connection substrate when it was the former Although it had to prepare in the body device which arranges two-dimensional on the outskirts, or needs a function, the volume as actual equipment became large and densification was not able to be attained In this invention, to the drive of a fingerprint sensor to the tooth space of the rear face of a fingerprint sensor as fingerprint sensor equipment for being attached to especially a personal digital assistant by connecting a required semiconductor chip When much more high-density-assembly-ization is attained, and the effectiveness of raising packaging density remarkably is acquired, and the connection distance of a driver IC, memory, etc. and a fingerprint sensor becomes short and you need mass information, also in improvement in the speed, it can obtain effectiveness.
[0056] Moreover, the connection electrode with which the portable telephone of this invention was formed in the sensor side at one side of a mounting substrate which mounts the components of a cellular phone, The fingerprint sensor by which the penetration electrode for connecting the electrode for connection formed in the rear face was formed is mounted with the connection terminal by the pewter. Where a sensor principal plane is exposed, the coat of

the closure resin is carried out, and LSI and the chip which constitute other cellular phones are mounted in the same field and same rear face of a mounting substrate. This mounting substrate has structure stored in the case with the components which constitute cellular phones, such as other microphones, a loudspeaker, an antenna, a display, a cell, and a keypad, while a fingerprint sensor is located in the part by which opening was carried out to some cases, and it exposes a sensor side and protects an appearance.

[0057] Since densification by the simplification of the appearance protective cap of a fingerprint sensor can be attained and the electrode formed in the rear face in the dimension of a fingerprint sensor is performing electrical installation of sensor equipment based on such a basic configuration, the rate of the dimension which sensor equipment occupies is equal to the magnitude of a fingerprint sensor, and the mounting structure of the personal digital assistant device which raised packaging density can be offered. Moreover, although this invention has described the mounting structure of a portable telephone, an IC card, the key of an automobile, the key of a housing door, etc. are small, and high-density mounting structure can be offered by having a function individually to the components whose security improves, or the components which need weatherability, for example.

[0058] In addition, it is clear that this invention is not limited to each above-mentioned example, but each example may be suitably changed within the limits of the technical thought of this invention.

[Translation done.]